Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2 and 25 of the	)	ET Docket No. 98-206
Commission's Rules to Permit Operation	)	RM-9147
of NGSO FSS Systems Co-Frequency with	)	RM-9245
GSO and Terrestrial Systems in the Ku-	)	
Band Frequency Range	)	
and	)	
Amendment of the Commission's Rules	)	
to Authorize Subsidiary Terrestrial Use	)	
of the 12.2-12.7 GHz Band by Direct	)	
Broadcast Satellite Licensees	)	
and Their Affiliates	)	

REPLY COMMENTS OF DIRECTV, INC.

Gary M. Epstein
James H. Barker
LATHAM & WATKINS
1001 Pennsylvania Avenue, N.W.,
Suite 1300
Washington, D.C. 20004-2505
(202) 637-2200

Attorneys for DIRECTV, Inc.

Dated: April 14, 1999

TABLE OF CONTENTS

I. INTRODUCTION & SUMMARY 1

II. THE NORTHPOINT SYSTEM SHOULD NOT BE PERMITTED TO OPERATE IN THE 12 GHZ BAND 4

A. There Is No Doubt That The Introduction Of Northpoint Operations Into The 12.2 – 12.7 GHz Band Will Cause Harmful Interference To DBS Operations 6

B. Northpoint's Comments Demonstrate A Complete Unawareness Of The Sharing Criteria Necessary To Protect DBS Service From Harmful Interference 9

1. Secondary service protection of primary services 11

2. The relative standing of interference from different sources 13

3. Established sharing precedents in a band and equal sharing among inter-service systems 15

4. Recognition of the accumulated effect of interference from all sources 17

C. Northpoint Continues to Ignore The Importance Of Link Availability To DBS Service Quality 17

D. Parties Agree That Data Gathered As A Result Of Northpoint's Testing Are Extremely Questionable And Do Not Provide Support For Northpoint's Claims Of Non-Interference With BSS 21

1. Impact of multiple transmitters 22

2. Impact of the spacing of individual transmitters 23

3. Impact of increased transmitter power 23

4. Impact of multipath interference 24

E. The Northpoint Test Results Are Wholly Inadequate To Support Northpoint Operations At 12 GHz 25

1. Further analysis of Austin test data 27

F. Northpoint Has Not Demonstrated Why It Must Use The DBS Downlink Band 29

III. MORE WORK MUST BE DONE TO ENSURE THE CO-EXISTENCE OF NGSO OPERATIONS WITH GSO BSS SYSTEMS BEFORE NGSO SYSTEMS CAN BE PERMITTED TO OPERATE AT 12 GHZ 30

A. SkyBridge Has Not Adequately Addressed BSS Concerns 30

B. Impact On NGSO Systems Of A Tightening Of EPFD Limits 33

C. Number Of NGSO Systems 33

D. Long-Term EPFD Limit Determination 34

E. Artificial Separation Of Long-Term And Short-Term Interference Limits 35

F. Protection Of Future BSS Systems 36

G. Protection of BSS Operations Against NGSO Failures 37

H. NGSO FSS Gateways and BSS User Terminals Cannot Share the 17 GHz Band 37

IV. CONCLUSION 39

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Parts 2 and 25 of the	)	ET Docket No. 98-206
Commission's Rules to Permit Operation	)	RM-9147
of NGSO FSS Systems Co-Frequency with	)	RM-9245
GSO and Terrestrial Systems in the Ku-	)	
Band Frequency Range	)	
and	)	
Amendment of the Commission's Rules	)	
to Authorize Subsidiary Terrestrial Use	)	
of the 12.2-12.7 GHz Band by Direct	)	
Broadcast Satellite Licensees	)	
and Their Affiliates	)	

REPLY COMMENTS OF DIRECTV, INC.

DIRECTV, Inc. ("DIRECTV") hereby offers the following reply comments in connection with the Commission's Notice of Proposed Rulemaking ("Notice") in the above-captioned proceeding.

I. INTRODUCTION & SUMMARY

In its initial comments to this proceeding, Northpoint claims to have demonstrated an "ingenious technology" that "has been proven by extensive field testing" to avoid causing "harmful interference to DBS."[1] Northpoint also claims that "approving Northpoint technology

---

[1] Comments of Northpoint at i. DBS is known internationally as Broadcast Satellite Service ("BSS"), and the terms are used herein interchangeably.

and granting the associated applications for licenses to provide service nationwide" will "ignite competition to cable and multichannel video distributors."[2]

As DIRECTV discussed in its initial comments and reiterates below, none of these claims is accurate. First, the Northpoint technology is not "ingenious." It is a straightforward point-to-multipoint microwave system that can easily operate in a variety of frequency bands, and that replicates the functionality of services, such as Local Multipoint Distribution Service ("LMDS"), for which the Commission has already made ample spectrum available.

Second, the Northpoint system will *not* avoid causing harmful interference to DBS operations as Northpoint claims. To the contrary, Northpoint operations at 12 GHz will cause harmful, wide-scale interference with the DBS service on a nationwide basis.[3] Every party in this proceeding that has addressed the technical merits of Northpoint's proposed operations in the 12.2 - 12.7 GHz band has highlighted the *incompatibility* of Northpoint's proposed operations with DBS operations. Indeed, it is plain from Northpoint's comments that Northpoint lacks a fundamental understanding of the interference protection needs of the DBS service, as well as the established precedents that provide such protection.

The results of the Northpoint experiments certainly do not support Northpoint's claims of non-interference with DBS. Other parties have supported DIRECTV's view that the experimental data relied upon by Northpoint to support its assertions of non-interference are

---

2 Comments of Northpoint at i.

3 Northpoint itself has acknowledged that, under the name of "BroadwaveUSA," it has sought to offer its service in all 211 television markets across the United States. *Id.* at 11; *see* Wireless Telecommunications Bureau Seeks Comment on Broadwave Albany, L.L.C., et al. Requests for Waiver of Part 101 Rules, Corrected Public Notice, DA 99-494 (rel. Mar. 11, 1999).

extremely incomplete and questionable.[4] Careful analysis of Northpoint's experimental progress reports has shown them to be riddled with erroneous assertions and to demonstrate an alarming lack of understanding of the complex technical issues involved with determining the harmful interference effects of the Northpoint system on the provision and receipt of high-quality DBS service. Furthermore, even accepting Northpoint's data at face value, the test results do in fact evidence either complete signal interruption or serious degradation to DBS service link availability.

Finally, Northpoint's claim that its 12 GHz operations will engender increased competition in the multichannel video programming distributor ("MVPD") market. Exactly the opposite is true. By causing complete interruption of DBS service within the vicinity of Northpoint transmitters (or throughout a Northpoint service area due to multipath effects), and by otherwise severely degrading DBS downlinks, the introduction of Northpoint's technology at 12 GHz poses a significant threat to the *only* alternative MVPD technology recognized by the Commission to offer a serious prospect of competing with incumbent cable operators.[5] An interference-free environment for DBS operators as primary service providers in the 12 GHz band is essential for the DBS industry to maintain and expand its current base of almost 9 million subscribers. Indeed, this is what the Commission had in mind when it transitioned terrestrial systems *out* of the 12 GHz band when the service was authorized. While DIRECTV does not

---

4 *See, e.g.,* Comments of Echostar at 9-11; Comments of SkyBridge at 112-113; Comments of Sullivan Telecommunications Associates at 10; Comments of USSB at 4-12.

5 *See, e.g.*, Annual Assessment of the Status of Competition in Markets for the Delivery of Video Programming, CS Docket No. 98-102 (rel. Dec. 23, 1998) ("1998 Competition Report"), at 62.

oppose the establishment of Northpoint service in other frequency bands, DIRECTV urges the Commission to reject Northpoint's proposal to use the 12 GHz spectrum.

With respect to the question of allowing NGSO service downlink operations in the 11.7-12.7 GHz bands -- which also would overlap with the entire 12.2-12.7 GHz band used for DBS downlinks -- DIRECTV again urges the Commission not to take action that will jeopardize existing and future DBS operations. Based on the record compiled thus far, more work must be done to ensure the absence of harmful interference with BSS operations if NGSO FSS and GSO BSS systems are to co-exist.

The Commission's actions in this proceeding will affect billions of dollars of investment by the U.S. DBS industry. Therefore, extreme care is warranted. The stakes are simply too high for the DBS operators and their millions of subscribers, and for the state of MVPD competition to cable television generally, for the Commission to introduce potentially enormous interference sources into the BSS downlink band without fully understanding the implications of such action.

II. THE NORTHPOINT SYSTEM SHOULD NOT BE PERMITTED TO OPERATE IN THE 12 GHz BAND

Northpoint's comments continue to characterize the Northpoint technology in part as a method of "enabl[ing] DBS providers to offer local broadcast signals."[6] Northpoint envisions its service as a "local programming solution" that will "be easy to integrate through either a wholesale relationship with DBS service providers or on a standalone basis through direct contractual arrangements with DBS customers."[7]

---

6 Comments of Northpoint at 13.

7 *Id.*

Given recent actions by the federal courts[8] and the rulemaking proceeding decided on an expedited basis by the Commission regarding interpretation of the Satellite Home Viewer Act,[9] it should be obvious that no parties have a greater interest in finding a "local programming solution" than the DBS providers themselves. However, the Commission should find it dispositively significant that the three high-power DBS operators currently providing commercial service that have examined Northpoint's technology have vigorously opposed the introduction of Northpoint operations into the DBS downlink band.[10]

The reason is simple. The 12.2-12.7 GHz band is the "mission critical" frequency band for U.S. DBS service. And those parties that have seriously assessed the technical merits of the Northpoint technology recognizes that Northpoint misapprehends regarding the severity of the interference risk its system poses to DBS operations.

DIRECTV wishes to emphasize that, in spite of its strong objection to Northpoint operations at 12 GHz, DIRECTV does not oppose Northpoint operations in other frequency bands that have been expressly identified by the Commission for the types of terrestrial operations that Northpoint proposes. However, to allow Northpoint to co-exist with DBS

---

8 *See* CBS, Inc. et al. v. PrimeTime 24 Joint Venture, *Final Judgment and Permanent Injunction*, Case No. 96-3650-CIV-NESBITT (S.D. Fla.) (Dec. 30, 1998); *ABC, Inc. v. PrimeTime 24 Joint Venture*, 17 F. Supp. 2d 467 (M.D.N.C. July 16, 1998).

9 In the Matter of Satellite Delivery of Network Signals to Unserved Households for Purposes of the Satellite Home Viewer Act, CS Docket No. 98-201, *Report and Order* (rel. Feb. 2, 1999).

10 *See* Comments of DIRECTV at 23-32 & Technical Appendix B; Comments of Echostar at 8-15 & Technical Appendix B; Comments of USSB at 4-12; *see also* Comments of the Satellite Broadcasting and Communications Association ("SBCA") at 3-7.

providers, even on a secondary basis, will invite the disruption of service to millions of DBS subscribers.

That is a prospect that the Commission should not countenance. Indeed, such a result would be completely contrary to more than two decades of policy governing the relationship between the DBS service and the terrestrial microwave services such as the one that Northpoint proposes. Pursuant to that policy, the Commission has sought to promote the development and expansion of DBS service by transitioning terrestrial interference sources *out* of the 12 GHz band.[11] Given the tremendous interference risk posed by Northpoint's operations, and the emerging success of the DBS industry, the Commission should not change course now.

A. There Is No Doubt That The Introduction Of Northpoint Operations Into The 12.2 – 12.7 GHz Band Will Cause Harmful Interference To DBS Operations

The record establishes that the Northpoint technology will have at least two separate harmful interference effects on DBS operators.

The first type of harmful interference effect is the direct interruption of DBS subscribers' reception of satellite signals, regardless of weather conditions. Sufficiently high levels of interference can cause very high bit error rates in the receiver, which, at a minimum, will disrupt

---

11 *See* Public Notice, *Initiation of Direct Broadcast Satellite -- Effect on 12 GHz Terrestrial Point-to-Point Licensees in the Private Operational Fixed Service,* 10 FCC Rcd 1211 (1994) (Relocation "of existing 12 GHz [terrestrial] users was deemed necessary because of the likelihood of interference that terrestrial use would cause to DBS service if both were operating in the same geographic area"); *Inquiry into the development of regulatory policy in regard to Direct Satellites for the period following the 1983 Regional Administrative Radio Conference*, 90 FCC 2d 676 (1982).

the video and audio decoder circuits in the DBS set-top box and can prevent the demodulator[12] from locking onto the satellite signal altogether. Such high interfering signal levels are likely to be suffered by DBS receivers in the immediate vicinity of the Northpoint transmitters, or by a DBS receiver experiencing multipath effects in any part of the Northpoint service area.

An example of this kind of interference threat can be found in a recent *ex parte* letter to the FCC regarding its pending request for special temporary authority to conduct tests in the Washington, D.C. area (which DIRECTV has opposed), in which Northpoint provides a C/I analysis of its proposed test.[13] In this analysis, C/I contours of 6 dB are evident in the colored maps appended to the filing.[14] By Northpoint's own admission, these C/I levels are low enough to cause loss of demodulator lock, illustrating that this kind of harmful interference to DIRECTV subscribers is probable if the proposed Washington, D.C. test is authorized.

DIRECTV also agrees that Northpoint has severely underestimated the extent of its exclusion zones "by failing to address the aggregate interference from its fully deployed terrestrial system, erroneously assuming that a C/(N+I) ratio corresponding to freeze frame can be used to define the exclusion areas, and other dubious assumptions." [15] This aggregate

---

12 The demodulator is that part of the DBS set-top box that directly translates the received signal from the DBS satellite to a digital bit stream. This digital bit stream is then further processed by the set-top box to produce video, audio, and other program information along with program control information.

13 Letter from Eric C. Broyles, Counsel to Diversified Communications Engineering, Inc., to M. Roman Salas, Secretary, FCC (April 5, 1999).

14 *Id.* at Attachment , Delawder Communications, Inc., "Engineering Supplement in Support of Request for STA to Test the Northpoint Technology System in the Washington, DC Area" (April 5, 1999).

15 Comments of Sullivan Telecommunications Associates at 10; *see* Comments of USSB at 9-10.

interference, aggravated by multipath effects, can cause direct signal outages to DBS subscribers. Given that DBS user antennas are ubiquitously deployed across the United States, the Northpoint system thus *is certain* to cause harmful interference with DBS operations.[16] Moreover, any proposals to mitigate such harmful interference from a secondary interference source such as Northpoint on a subscriber-by-subscriber basis are difficult to implement, at best,[17] and impose a significant and unnecessary burden on DBS operators and their subscribers.

The second type of harmful interference problem is less obvious, but is no less destructive over time to the reliability of DBS service. Because of the substantial "clear weather" signal margins necessary to help DBS operators ensure high-quality service, Northpoint signals may not always cause visible disruption to DIRECTV digital signals. However, if the Northpoint system is actually deployed, the interference that it will create in the 12 GHz band over time will lower these clear weather margins and will significantly increase the number and length of downlink rain outages.

Furthermore, the nature of the Northpoint interference with DBS service to consumers is such that the mitigation measures advocated by Northpoint will do little to reduce the size of the

---

16 Comments of Sullivan Telecommunications Associates at 10.

17 For example, as Echostar observes, Northpoint's suggestion of placing shielding plates around the DBS antenna to block interference is in most cases unworkable, since it would either be aesthetically or economically unacceptable to subscribers. *See* Comments of Echostar at 10. DIRECTV also agrees with USSB that given the "known incompatibility between DBS and terrestrial microwave services, Northpoint has an obligation to do more than merely state that interference can be eliminated by simple measures." Comments of USSB at 10 (footnote omitted).

exclusion zones created by its service, which is proposed to be deployed on a nationwide basis.[18] The problem of mitigating this kind of harmful interference from a secondary interference source such as Northpoint on a subscriber-by-subscriber basis is exacerbated because the source of the problem (the Northpoint transmissions) will be difficult for such subscribers to identify. The subscriber will experience poorer performance, in the sense that he or she will notice that his or her receiver seems more sensitive to rain than it once was, but the subscriber will not be able to identify the true cause of the interference. As a consequence, the subscriber might cease subscribing to DBS service altogether.

DIRECTV has carefully evaluated the impact of the Northpoint service on the amount of outage that would be experienced by DBS customers forced to co-exist with Northpoint operations at 12 GHz. The analysis shows that the introduction of the Northpoint service into the DBS downlink band will cause a significant increase in the likelihood and frequency of customer outages *over more than 50% of Northpoint service areas*. That consequence of the deployment of the Northpoint system is unacceptable, and is cause for rejection of Northpoint's secondary operations in the 12 GHz band.

B. Northpoint's Comments Demonstrate A Complete Unawareness Of The Sharing Criteria Necessary To Protect DBS Service From Harmful Interference

It is clear from its initial comments that Northpoint lacks a fundamental understanding of the interference protection requirements of BSS systems, as well as the established international precedents that provide such protection. Northpoint has proffered various purportedly acceptable

---

[18] *See* Comments of Sullivan Telecommunications Associates at 10 & n.17; Comments of Echostar at 10-11; Comments of USSB at 10-11.

Northpoint/BSS interference protection values, expressed as a C/I ratio in dB, that range from 5 dB[19] to 9 dB[20] to 20 dB.[21] All of these values are woefully inadequate to contemplate co-existence with the DBS service. None of these proposed protection thresholds (i) has any technical merit or standing within the accepted standards of the satellite communications industry; (ii) can be reconciled with established precedent for the protection of satellite telecommunication links; or (iii) even recognizes the impact on BSS link unavailability, which has been accepted in the much wider technical community of ITU study groups such as JWP 10-11S and JTG 4-9-11 that currently are addressing NGSO FSS/GSO sharing issues.

In general, in establishing protection criteria for a proposed new service, such as Northpoint, relative to an existing service, DIRECTV believes that several important factors must be taken into account. These factors include, but are not necessarily limited to:

- The standing of the new service relative to established services in the band (primary or secondary);
- The relative standing of the proposed interference levels to those levels that can reasonably be expected from other sources, *i.e.*, whether from the same service (intra-service sharing) or from a different service (inter-service sharing), and whether from single systems or from the combined level for all systems of the same type;
- Recognition of established precedent for sharing criteria in a given band;

---

19 Comments of Northpoint at 18.

20 *Id.*

21 *Id.* at 8.

- A reasonable and equitable sharing of the total interference burden among the new inter-service interference sources; and
- Recognition of the accumulated effect of interference from all sources.

Each of these items is discussed in more detail below.

1. Secondary service protection of primary services

Northpoint proposes that its new terrestrial service be a "secondary" service in the 12 GHz band relative to DBS,[22] but "co-primary" with NGSO FSS operations in the band.[23] As a threshold matter, Northpoint's use of these terms is confusing. What Northpoint appears to be proposing is that DBS operators will be accorded primary status in the band, while Northpoint and NGSO operations will be accorded co-*secondary* status.

In any event, however, the imprecision of Northpoint's regulatory characterization is irrelevant because Northpoint has not shown that it can operate in the 12 GHz band even on a secondary basis. By definition, secondary status at 12 GHz means that a terrestrial licensee (i) "shall not cause harmful interference to primary or permitted services to which frequencies are already assigned," *i.e.*, DBS; and (ii) "cannot claim protection from harmful interference from stations of a primary or permitted service."[24] DIRECTV's calculations have shown that harmful interference will occur at any of the C/I levels proposed by Northpoint.

Specifically, serious degradations in service quality and repeated interruptions of signal reception are absolutely guaranteed to occur if a C/I criterion of 5 dB is used, since this reduces

---

22 Comments of Northpoint at 23.

23 *Id.* at 26.

24 47 C.F.R. § 2.104(d)(i),(ii).

the link margin to zero. In other words, a C/I of 5 dB eliminates the possibility of the operation of a DBS service, even under clear sky conditions. There is no accommodation for any link degradations, no accommodation for weather or atmospheric fading effects, and no accommodation for multipath effects of the interfering signal.[25]

At a C/I criterion of 9 dB, which Northpoint asserts is all that "DBS providers . . . need . . . to avoid harmful interference,"[26] static and temporal multipath effects are certain to cause repeated interruption in service for most DBS subscribers. Indeed, a C/I ratio of 9 dB would result in an increase in outage for DIRECTV customers ranging from 600% (outage duration increase of 6 times) to 2000% (outage duration increase of 20 times) -- a condition that would be true across the United States, and not merely in rainy areas of the country.

Finally, at a C/I of 20 dB, severe degradation in service quality also will be experienced by subscribers. These consumers will experience a 17% degradation in satellite unavailability using this criterion. This means that the number of outage hours experienced by DBS subscribers will increase by 17% via more and longer outages.

Clearly, none of the protection thresholds proposed by Northpoint are acceptable, even if Northpoint is accorded secondary status in the 12 GHz band, if the viability of DBS service is to be preserved and promoted.

---

25 Indeed, the typical DBS link *will not even close* with a C/I ratio of 5 dB, meaning that the DBS subscriber will receive no signal at all.

26 *Id.*

2. The relative standing of interference from different sources

The proposed Northpoint service is terrestrially-based and clearly is not a part of the BSS or the ITU Appendix 30 Plans. Thus, the Northpoint proposal raises a problem of inter- (rather than intra-) service sharing.

All of the Northpoint-discussed sharing criteria -- *i.e.*, C/I values of 5, 9 or 20 dB -- allow more interference than will typically be seen by an operational U.S. DBS system from adjacent BSS systems. Indeed, DIRECTV has estimated that the aggregate interference level from *all* adjacent BSS systems will result in a typical C/I value of 20.2 dB. One BSS system 9° away, operating at the same EIRP levels to any given point in the U.S. as the BSS link in question, will provide interference at a conservative level of 23.6 dB when using the Annex 5 Figure 8 pattern of Appendix 30 as the victim earth station antenna pattern. This comparison helps to put the Northpoint thresholds in perspective as *per se* unreasonable.

Specifically, the Northpoint-discussed C/I criterion of 5 or 9 dB provide much higher levels of interference than are realized from same-service (BSS) interference sources. The Northpoint-discussed 20 dB C/I criterion *by itself* is about the same as the interference expected from *all* BSS sources. Given that the BSS Plans are established around the principle of carefully managing intra-service interference to acceptable levels, allocating this same interference level to one system from a different service is both disproportionate and inefficient from the standpoint of spectrum utilization. Northpoint-generated interference should be significantly less than

interference caused by all BSS sources. This is another reason that Northpoint operations at 12 GHz should not be permitted.[27]

Figure 1 below provides an interesting perspective on the impact on unavailability (or outage time) as the C/I is varied. The figure provides curves for several cities across the United States.

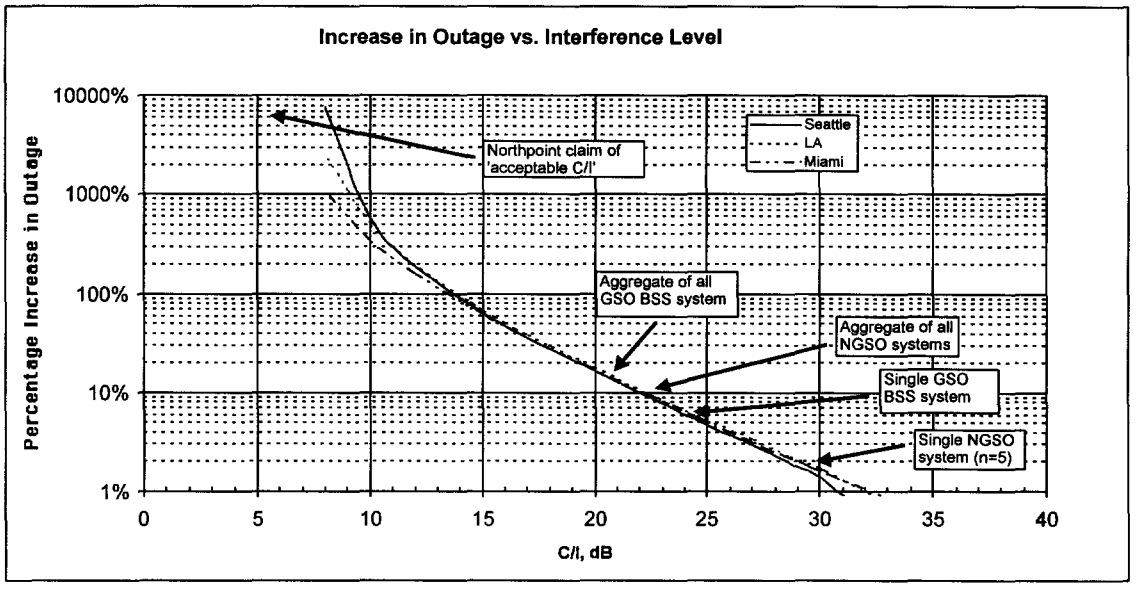


Figure 1

Note in the figure how the typical aggregate BSS intra-service interference level (C/I = 20 dB) generates a higher impact on unavailability than the aggregate NGSO FSS inter-service interference level (C/I equivalent to about 21.6 dB). Given this NGSO FSS aggregate level, the single entry levels must be 7 dB lower if there are 5 NGSO FSS systems that can reasonably be

---

27 A gross inequality of this type is easily seen in the Technical Annex to the Comments of Northpoint at Table 4. Here, line 15 optimistically allocates a C/I of 25 dB to adjacent satellite interference, while line 17 shows a terrestrial interference C/I of 8 dB. Presentation of these kinds of disproportionate levels indicates a complete lack of appreciation for and understanding of the appropriate allocation of interference levels among inter- and intra-service interference sources.

expected to share a given band. Thus, inter-service aggregate interference levels are less than aggregate intra-service interference levels, and the inter-service aggregate level is equally divided between systems to arrive at a single entry interference allocation per system. Note also that the 5 and 9 dB C/I levels discussed by Northpoint result in extremely high degradations in unavailability of 600% or higher for Seattle.

In general, Northpoint appears to be understating the C/I values induced by its system over the Northpoint service area. Of particular concern are two figures included in the Technical Annex to Northpoint's comments. These figures purport to show Northpoint's high C/I ratios throughout the majority of the Northpoint service area.[28] Upon closer scrutiny, however, it becomes clear that the values assumed for key technical parameters required to create these figures have been left unspecified. Not least among these parameters is the EIRP assumed for the DBS system (which translates directly into the value of C in a given C/I ratio). Also left unspecified are the values assumed for the Northpoint transmitter power and the tilt angle of the Northpoint antenna. The lack of these critical parameters makes it extremely difficult to validate Northpoint's optimistic claims regarding the ability of its system to avoid harmful interference with DBS. The evidence points to a contrary conclusion.

3. Established sharing precedents in a band and equal sharing among inter-service systems

DIRECTV has participated very actively in the establishment of inter-service sharing criteria for sharing between NGSO FSS and GSO BSS systems. After more than a year of intensive international work, and after thoroughly examining existing precedents for sharing in

---

[28] Comments of Northpoint, Technical Annex at 17, Figs. 11 and 12.

the band taking into account the real needs of modern BSS operators, the international NGSO FSS and GSO BSS communities generally have agreed on sharing criteria. The inter-service sharing criteria are stated in the Preliminary Draft New Recommendation ("PDNR") from the October 1998 Geneva JWP 10-11S meeting. There, it was agreed that all NGSO FSS systems together, in the aggregate, would not degrade the unavailability of GSO BSS systems by more than 10%, and would not cause a "freeze frame" video impairment under clear sky conditions. According to the PDNR, each NGSO FSS system will be effectively allocated a portion of the 10% unavailability budget. The ultimate allocation for each NGSO system thus will depend on a decision by the Commission regarding the number of NGSO FSS systems, or "n," that can reasonably be expected to share the same frequency band.

These important inter-service sharing criteria, the first established since the introduction of digital BSS systems, must be taken into account when examining the inter-service sharing proposed by Northpoint. Not to do so would create a large inequality among the sharing requirements for Northpoint and new NGSO proposed services. Simply put, if Northpoint-like systems are permitted to enter the band, then the Northpoint system must be allocated the same interference allowance as one NGSO FSS system. That is, each inter-service system - - whether it is a single NGSO FSS system or a Northpoint system -- must be limited to an equal share of the aggregate permissible interference burden. Thus, if the number of NGSO-FSS systems that can share a band is 5, then each NGSO-FSS system and Northpoint-type system would be allocated an equivalent interference unavailability degradation of 2%, with no more than 5 total systems (*inclusive* of Northpoint-type and NGSO systems) permitted to operate in the 12 GHz

band. To allocate a larger interference allowance to Northpoint would degrade BSS service to an unacceptable level.

4. Recognition of the accumulated effect of interference from all sources

It is very important for the Commission to recognize that BSS links, like all satellite links, must accommodate interference from many different sources. This fact must be taken into account when developing sharing criteria. BSS links must, among other things, accommodate internal interference from cross-polarization effects, interference from adjacent BSS satellites (both domestic and foreign), interference from NGSO-FSS systems sharing the same band, and interference from any remaining terrestrial fixed microwave sources lingering at 12 GHz. With the addition of Northpoint to this interference environment, each interference component must be included in a link budget analysis. Each component in turn reduces the availability of the BSS signal, given a fixed satellite EIRP. To allocate, as Northpoint argues, an *additional* 10% in unavailability degradation due to Northpoint sources would clearly add an unacceptable burden on DBS links, given this interference environment. Northpoint's proposal cannot and should not be accepted.

C. Northpoint Continues to Ignore The Importance Of Link Availability To DBS Service Quality

Northpoint has developed a DBS link budget which purports to allocate all of the available margin in a DBS link to accommodate Northpoint interference.[29] However, the concept that Northpoint can simply use up the remaining "margin" in a link budget is fundamentally misplaced. Indeed, there is no unused margin in a DBS link budget. Every

---

[29] Comments of Northpoint, Technical Annex, at 12-13, Table 4.

available increment of transmitted power is used to improve link avail ability and hence improve service quality. Customers have now become accustomed to a given level of signal availability after more than 4 years of DIRECTV service. Maintenance of this level of signal availability is vitally important.

It is DIRECTV's goal to maintain and, if technically practical, improve upon this measure of service quality. To understand how important link availability is to DIRECTV's service offering, the Commission should note that DIRECTV has had the option since the inception of its service to operate its 16 lower power transponders with less forward error correction coding.[30] If DIRECTV opted to do this, it would reduce link performance by almost 3 dB, with an attendant reduction in availability, but would also add 28% to the capacity of each transponder so configured. DIRECTV has, however, opted to maintain a higher level of forward error correction on these links to maintain high availability in lieu of added programming capacity. Once again, availability is an extremely important service quality issue, and it is important in maintaining a service that is competitive with cable. Indeed, system reliability and service quality are key selling points for DBS providers.

In this regard, Northpoint assumes a DBS requirement of signal availability of 99.7%.[31] This is incorrect for digital BSS transmissions in general, and for the DIRECTV service in particular. As the DIRECTV system was being designed, a design goal was established that the

---

30 Forward error correction is a very powerful technique used in modern digital transmission systems to improve transmission performance. Overhead information is added to the transmitted data stream that enables the receiver to partially or completely correct data that is received in error. This technique is effective for low to moderate received error rates, but when the error rates are high it becomes ineffective.

31 *Id.* at 12.

link availability should be better than 99.7%. This design goal came from the ITU BSS Plans, which were in turn based on FM analog TV carriers. For FM TV carriers, the quality of the received signal must be above a specific noise standard (and hence "available") for at least the specified 99.7% of the time. It is important to note that for an *FM TV carrier* meeting this 99.7% availability criterion, the video picture will still remain visible on the screen for greater than 99.9% of the time.

However, digital BSS transmissions at threshold conditions behave very differently. They change from a clear, clean image to a complete loss of picture over only a few tenths of a dB of change in carrier-to-noise ratio. The difference in carrier-to-noise ratio between when a picture is below the noise standard and when it is no longer visible becomes very small for digital BSS transmissions. Because of this effect, Japan has proposed that availability objectives for digital systems should be in the range of 99.5% to 99.9% *for the worst month* in order to provide the same level of service quality as originally envisioned in the Plans.[32] This equates to annual availability of 99.99% for digital systems,[33] which is equivalent in service quality to the 99.7% annual outage for an FM TV carrier.

It is for this reason that DIRECTV now strives as a minimum to maintain and as a goal to improve signal availability to higher levels. All of DIRECTV's unavailability degradation analyses, both for Northpoint sharing analysis and for NGSO FSS sharing analysis, assume that

---

32 Document 10-11 S/100, 7 Sept. 1995, Japan, "A consideration of the standard digital transmission parameters for the modernization of the WRC-BS Plan."

33 Average annual outage is estimated from worst-month outage by using equation (5) in ITU Recommendation P. 841.

the current calculated availability for a given link, with no remaining margin, is the proper availability reference. This same approach has been adopted in the JTG 4-9-11 studies.

A table in the Northpoint Technical Annex attempts to show that "residual margin" exists in a DBS link, even in the presence of a terrestrial interferor with a C/I value of 20 dB.[34] In its link budget, Northpoint "assigns" signal availability values to various U.S. cities. In two of the cases that Northpoint presents, the assigned availability is as low a 99.7%.

As described above, DIRECTV strongly disagrees with the premise of this table. It is not up to Northpoint to assign signal availability to DIRECTV's customers. That has already been established by years of quality service. There *is no margin* relative to the service availability that DIRECTV's customers enjoy and have come to expect. As such, the "margins" that Northpoint characterizes as "residual" do not exist.

Furthermore, Northpoint has mischaracterized DIRECTV's position by stating that "DIRECTV asserts that a 20% increase in unavailability. . . would seriously degrade the signal reception,"[35] referencing an early paper submitted by DIRECTV to the Commission in 1994 that addressed terrestrial interference in the DBS downlink band.[36] The implication by Northpoint is that degradation of less than 20% is acceptable. No such assertion was made in that document, however, and allocating 20% for the combined outage degradations of Northpoint and NGSO FSS sources is certainly unacceptable. Rather, two cases were developed to illustrate

---

34 Comments of Northpoint, Technical Annex at 16, Table 6

35 Comments of Northpoint, Technical Annex at 12.

36 DIRECTV, Inc., *Terrestrial Interference in the DBS Downlink Band* (filed April 11, 1994).

interference from terrestrial sources. One case chose loss of signal reception as the determinant in a calculation of a separation distance, and the other case chose 20% as the determinant in the calculation of separation distance.[37] Neither case was considered acceptable.

In any event, development of protection criteria has advanced considerably since 1994. As a result, single entry unavailability degradations of greater than 2% in the case of Northpoint interference simply are not acceptable.

D. Parties Agree That Data Gathered As A Result Of Northpoint's Testing Are Extremely Questionable And Do Not Provide Support For Northpoint's Claims Of Non-Interference With BSS

In its initial comments, DIRECTV noted in connection with Northpoint's experiments that Northpoint (i) collected insufficient data to warrant extrapolation of its experimental results (assuming their validity, which DIRECTV does not) to justify nationwide service; (ii) used multiple uncontrolled variables and unrepeatable data collection techniques that render Northpoint's data highly questionable; (iii) used bandwidth test signals and other inputs that did not replicate either real-world or worst-case interference scenarios; and (iv) overall, demonstrated a fundamental lack of technical understanding of BSS digital transmission.[38]

The comments of other DBS providers are consistent with DIRECTV's conclusions, and cite a variety of ways in which the Northpoint tests were flawed methodologically.[39] The tests

---

37 *See id.* at 11.

38 Comments of DIRECTV, Technical Appendix B at 17-21.

39 *See* Comments of Echostar at 8-12 & Technical Appendix B; Comments of SBCA at 6; Comments of USSB at 5-12.

certainly form no basis for the Commission to permit Northpoint to interfere with millions of subscribers' receipt of DBS service.

In particular, Northpoint has neglected to address several critical factors in both its testing and analysis. When these factors are taken into account, Northpoint's claims of non-interference with DBS operations are undercut even further. Among the critical factors that Northpoint has failed to address in both its experimental testing and its analysis are:

- the impact of multiple transmitters;
- the impact of the spacing of individual transmitters;
- the impact of increased transmitter power; and
- the impact of multipath interference

These factors have a significant impact on the amount of interference that the Northpoint technology will cause into DBS receivers, as discussed in more detail below.

1. Impact of multiple transmitters

In its initial comments, Northpoint states that "with the Northpoint system, most customers will have at least three directions to point their dish to pick up Northpoint's service."[40] Northpoint, however, misses completely the obvious implication of this statement, *i.e.*, that most DBS receiving antennas within a Northpoint service area will be subjected to at least *three* interfering Northpoint signals. The impact of these multiple interfering signals will be cumulative, and will certainly exceed the impact of a single interfering signal. However, *both*

---

[40] Comments of Northpoint at 5.

the Northpoint experimental testing and the Northpoint analysis address only the single transmitter case.

It is clear that the Northpoint claims, which are based on the single transmitter case and not the multiple transmitter case of a fully deployed Northpoint system, underestimate the interference induced into DBS receiving antennas. The aggregate interference caused by multiple Northpoint transmitters will greatly exceed the "single entry interference addressed by Northpoint."[41]

2. Impact of the spacing of individual transmitters

Northpoint also makes no mention of the spacing of individual transmitters that it intends to use in its system. However, Northpoint's stated plans to provide "multiple line-of-sight options"[42] (at least three) to its customers and to "include service to all parts of a community, including areas that are in a valley or over a hill"[43] suggest that, particularly in problem areas, the Northpoint transmitters may well be placed within 5 miles of one another. Such a tightly packed network of transmitters *is certain* to severely impact the amount of outage experienced by DBS customers throughout the entirety of the Northpoint service area. Of course, the Northpoint experimental testing and analysis fail to reflect this effect; again, Northpoint has considered only the single transmitter case.

---

41 Comments of Sullivan Telecommunications Associates at 10 & n.12.

42 Comments of Northpoint at 5.

43 *Id.*

3. Impact of increased transmitter power

In the Northpoint experiments, the transmitter power was limited to –25 dBW. The Northpoint technical analysis also is based on this value. However, in the description of the system characteristics of the Northpoint technology listed in Northpoint's comments,[44] the range for the transmitter power was stated to be –30 to +6 dBW. A transmitter power of +6 dBW, which is over *1,000 times* the transmitter power used in the Northpoint testing and analysis, likely would *completely eliminate* the operation of any DBS service within the Northpoint service area.

DIRECTV's analysis, submitted in connection with its initial comments, has shown that, even under optimum conditions, Northpoint would have to use a transmit power much larger than –25 dBW in many markets throughout the U.S. in order to provide a service availability anywhere near that of existing DBS services.[45] Northpoint's claims do not reflect the system parameters of an actual deployed Northpoint system, which poses an extreme interference threat to DBS operations.

---

44 *Id.*, Technical Annex at 2.

45 Northpoint itself has suggested that it should be permitted to operate at higher power in areas that are removed from existing DBS subscribers. As DIRECTV has explained, such operation not only would cause critical levels of interference into DBS receiving antennas, but also fundamentally misapprehends the nature of DBS service. *See* Comments of DIRECTV, Technical Appendix B at 17-18. DBS equipment is being sold and used by subscribers across the country without restriction. Installation of a high-power Northpoint transmitter would preclude entirely the use of BSS receiving antennas anywhere in the area until the Northpoint transmitter was turned off. *Id.* at 18. This notion is fundamentally contrary to Northpoint's claimed ability to operate on a secondary basis. It is also completely unacceptable, given the philosophy underlying the DBS service of providing nationwide service to subscribers, including those residing in remote areas.

4. Impact of multipath interference

Other DBS providers share DIRECTV's concern about Northpoint's complete failure to address the sizable impact of multipath interference in its description of Northpoint interfering signal levels.[46] The impact on DBS transmissions of the combination of reflected signals with the primary interfering signal, which is especially common in an urban environment, can be quite dramatic. This effect is even more pronounced because of the short wavelength of the signal in the DBS band (less than one inch). Interfering signal levels can grow to levels up to 4 times their nominal levels, due to the effects of multipath. The multipath problem is a severe, fundamental problem with the introduction of such a terrestrial system into the DBS downlink band that Northpoint completely ignores in its comments.

E. The Northpoint Test Results Are Wholly Inadequate To Support Northpoint Operations At 12 GHz

As set forth in Technical Appendix B to DIRECTV's initial comments, even accepting at face value the validity of Northpoint's experimental results -- which DIRECTV does not -- Northpoint's own test data show that DIRECTV's service link availability was *seriously degraded at all but one of Northpoint's test sites*, in complete contradiction of Northpoint's claims. Signal meter readings from Northpoint's Austin tests actually confirm DIRECTV's analysis that Northpoint's system will create unacceptable interference for DBS service over a majority of Northpoint's proposed service area.[47] Northpoint's test data show plainly-manifested interference far beyond the limits of any reasonable sharing criteria.

---

46 Comments of Echostar at 10; Comments of USSB at 11-12; *see also* Comments of SkyBridge at 113.

47 *Id.* at 21-24.

In responding to this point, it is extremely disingenuous, as DIRECTV has already observed in its initial comments,[48] for Northpoint to assert that there is some significance attached to Northpoint's failure to receive "a single" call from DBS subscribers on its customer service hotline "to report interference attributable to Northpoint's operations"[49] during a month of Northpoint testing in Austin, Texas in December 1998. First, Northpoint's notice to DBS subscribers of its testing appeared in a very small classified advertisement in a single newspaper for only one day approximately two weeks before the December test.[50] It is highly unlikely that this notice was sufficient to give DBS subscribers that may have experienced visible interference adequate knowledge of Northpoint's hotline in order to voice their complaints.

More fundamentally, the interference effects evidenced by the Northpoint data are long-term and cumulative. Because of the DIRECTV service's substantial "clear weather" signal margins, which are essential to ensure that DBS subscribers receive reliable and high-quality service, Northpoint signals may not in the short-term always cause visible disruption to DIRECTV's digital signals. However, if the Northpoint system is actually deployed, the interference that it will create in the 12 GHz band over time will lower these clear weather margins and cause a significantly increased number of downlink rain outages that will last for increasingly longer periods of time.[51] These effects might not manifest themselves in a month-long test (although the interference created by the Northpoint system in fact was evidenced

---

48 Comments of DIRECTV at 26-27.

49 Comments of Northpoint at 5.

50 A copy of Northpoint's Affidavit of Publication, including the advertisement, was included with DIRECTV's initial comments as Attachment C.

51 *See* Comments of DIRECTV, Technical Appendix B at 27.

during the December 1998 tests). However, as a DBS subscriber begins to lose service as rain outages become longer and more frequent, completely eliminating the subscriber's picture, the consequences of the Northpoint interference are no less severe. DBS subscribers have come to expect picture quality, service availability and reliability that is superior to that provided by other MVPDs, including incumbent cable television operators. The Northpoint system threatens to eliminate those benefits, and accordingly, to reduce the DBS industry's cable-competitiveness. That result is not in the public interest.

1. Further analysis of Austin test data

Section 3.2 of Technical Appendix B to DIRECTV's initial comments discusses degradation in DBS link unavailability that can be inferred from the Austin test data. The discussion notes that a reduction of 0.6 counts on the signal meter reading due to added interference ('dssp' column in Table 3.2.1-1 of that Appendix, or Table 1 shown below) is equivalent to a 2% increase in unavailability.[52]

Table 3.2.1-1 of DIRECTV's Technical Appendix B is reproduced below with additional columns. The far left column shows the change in unavailability that can be estimated from the signal meter reduction values recorded in the Austin tests.

To perform this calculation, the values in the dssp column (see Table 1) were each divided by 6 to obtain the estimated reduction in C/N ratio.[53] Then, assuming an Austin clear sky C/N value for the BSS signal of 11.5 dB (without interference), the added C/I needed to degrade the C/N by this amount was determined. The curve in Figure 1 (unavailability

---

52 *Id.* at 22-25.

53 *See id.* for more information on the signal meter and its relationship to C/N degradation.

degradation as a function of C/I) was then used to determine the change in unavailability given this value of C/I.

Site No.	Name	sspo	dssp	C/N Degradation	Derived C/I	Unavailability Change
		Signal Meter Units	Signal Meter Units	dB	dB	%
3	Palmer	75.5	12.9	2.15	13.4	**100**
1	Hyatt	78.8	11.6	1.93	14.0	**90**
7	Palmer*1	80.3	7.1	1.18	16.5	**42**
4	American-Statesman	83.2	6.2	1.03	17.2	**33**
9	Palmer*3	66.8	6.2	1.03	17.2	**33**
12	3rd & Christopher	69.8	4.2	0.70	19.1	**20**
13	Barton Creek Mall	83.4	3.2	0.53	20.3	**15**
8	Palmer*2	78.2	2.9	0.48	20.8	**14**
22	4th St. & San Antonio	78.2	2.8	0.47	21.0	**13**
15	IH-35 South	84.8	2.6	0.43	21.3	**12**
25	7th St. & Baylor	81.7	2.6	0.43	21.3	**12**
26	Southwest Pky 1	81.4	2.3	0.38	21.8	**10**
6	Coliseum	80.7	2.3	0.38	21.8	**10**
10	TX-DOT	80.6	2.3	0.38	21.8	**10**
24	11th St. & Guadalupe	80.2	2.3	0.38	21.8	**10**
11	3rd St. & Jewell	87.8	2.2	0.37	22.1	**10**
5	Jalisco's	86.0	2.2	0.37	22.1	**10**
28	Gains Ranch Rd	80.8	2.2	0.37	22.1	**10**
2	Salvation Army	86.1	2.0	0.33	22.5	**9**
27	Southwest Pky 2	83.1	2.0	0.33	22.5	**9**
16	Dais Ln Hill	88.5	1.9	0.32	22.7	**9**
13A	Barton Creek Mall	86.1	1.8	0.30	23.0	**8**
19	Glass Rd	82.4	1.8	0.30	23.0	**8**
14	Acc Pinnacle	85.4	1.7	0.28	23.2	**8**
21	Summit	85.9	1.4	0.23	24.1	**6**
29	HEB 1st & WnCannon	80.6	1.4	0.23	24.1	**6**
20	Fiesta Shores	81.2	1.3	0.22	24.4	**6**
18	Guerrero	80.1	1.2	0.20	24.8	**5**
13A-2	Barton Creek Mall	86.3	0.9	0.15	26.0	**4**
23	7th St. & Guadalupe	86.0	0.7	0.12	27.1	**3**
17	Thaxton	85.8	0.1	0.02	35.7	**<1%**

Table 1: Estimated Degradation in Unavailability, Austin Tests

First, note that for the Austin, Texas location *all but one site* showed estimated unavailability degradations in excess of 2%, and 18 of the 31 sites listed above had estimated unavailability degradations of 10% or more. One site showed an estimated *100%* unavailability degradation. Also note that small degradations in C/(N+I) result in significant degradations in unavailability. For Austin, a C/(N+I) degradation of only 0.12 dB results in a 3% increase in

unavailability. Such increases, from a BSS service degradation standpoint, are utterly unacceptable.

F. Northpoint Has Not Demonstrated Why It Must Use the DBS Downlink Band

There is consensus among the parties addressing Northpoint's proposal that it would be short-sighted and contrary to the public interest for the Commission to jeopardize current and future DBS operations to accommodate Northpoint's system operations. This is especially so when the technology that Northpoint proposes to introduce into the 12 GHz band is capable of being deployed in other frequency bands that are expressly allocated for the types of terrestrial operations that Northpoint proposes.

The sole rationale for Northpoint's desire to use the 12 GHz band seems to be its claim that its technology can use "commercially available" equipment.[54] This argument is extremely unpersuasive. While the 12 GHz band is vital for downlinking programming to DBS receiving antennas, the other components of DBS equipment used by the various DBS service providers *do not operate at 12 GHz.*

This fact goes to the heart of Northpoint's assertion that it must use the 12.2-12.7 band because of equipment compatibility issues. Although a DBS signal is transmitted at 12.2-12.7 GHz, only the LNB portion of the typical 18-inch satellite dish uses 12 GHz frequencies. The set top equipment uses a lower frequency as the signal is immediately down-converted to 950-1450 MHz so that existing distribution components can be used in the installation. Therefore, it is evident that Northpoint can use *any* frequency band for the type of service it proposes (*e.g.*,

---

[54] Comments of Northpoint at 14.

MDS, LMDS, or 38 GHz) already allocated by the Commission and still use commercially available DBS equipment, provided that the Northpoint antenna uses a suitable down-converter to convert the signal to 950-1450 MHz. It is already clear from Northpoint's system proposal that DBS subscribers will be required to add a second dish to receive the Northpoint signal. Given Northpoint's stated willingness to eliminate harmful interference to DBS systems at its own expense,[55] it is not unduly burdensome to require that Northpoint develop its own down-converter to avoid contaminating the DBS downlink band and degrading DBS service -- especially since Northpoint wishes to "piggy back" in large part off of the billion-dollar investment of the DBS industry for the remainder of its system.[56] Northpoint can and should use spectrum that has been expressly set aside for the precise operations it proposes. It should not be permitted to use the DBS downlink band.

III. MORE WORK MUST BE DONE TO ENSURE THE CO-EXISTENCE OF NGSO OPERATIONS WITH GSO BSS SYSTEMS BEFORE NGSO SYSTEMS CAN BE PERMITTED TO OPERATE AT 12 GHz

A. SkyBridge Has Not Adequately Addressed BSS Concerns

SkyBridge has presented a series of points that are intended to show how conservative its analysis has been in deriving epfd limit masks to protect GSO FSS and BSS systems.[57] SkyBridge prefaces these points with the assertion that "when the cumulative effect of these

---

55 *Id.* at 23.

56 *See also* USSB Comments at 5 (noting that "[a]t a minimum, a separate subscriber antenna and down-converter will be required, regardless of the frequency band used," such that "Northpoint's claim that it must use the 12.2-12.7 GHz frequency band to provide its service is without merit").

57 Comments of SkyBridge at 36.

assumptions is taken into account, the chance of a link being unprotected is exceedingly remote."[58] DIRECTV does not agree.

First, the probability that GSO links will in practice be unprotected has not been quantified. While some analysis has been performed by SkyBridge, this analysis was system-specific to SkyBridge's NGSO operations, and cannot be extrapolated to the general NGSO case. DIRECTV is concerned that the minimal SkyBridge analysis not be used as an excuse to leave unprotected certain links in the ITU CR-116 database. Given the immaturity of the technical understanding of NGSO service, and especially the lack of general knowledge about other types of NGSO system designs and their statistical behavior, optimistic speculation that links will be protected cannot and should not be relied upon by the Commission or industry to protect GSO operations. For example, the studies mentioned by SkyBridge as supporting its assertion that "not all GSO earth station locations and pointing directions are equally impacted by a given NGSO FSS system" are SkyBridge-specific and cannot be generalized.[59]

SkyBridge's next two points concern the worst case location and pointing direction of a GSO earth station subjected to the maximum power of an NGSO system.[60] Again, these assertions are SkyBridge-specific and cannot be generalized. Furthermore, SkyBridge's comment that "the maximum power will be experienced only during brief alignments of the NGSO satellite with the GSO satellite and earth station"[61] is still of concern to BSS operators.

---

58 *Id.*

59 *Id.* at 36-37.

60 *Id.* at 37.

61 *Id.*

The PDNR written by JTG 10-11S requires that these short-term high interference levels not cause any loss of video continuity or freeze frame conditions, no matter how brief. Moreover, this is only one of two primary concerns to the BSS industry. U.S. DBS providers rely primarily on small (45 cm) antennas for user terminals that are sensitive to lower-level long-term sources of interfering noise. The geographical distribution and extent of this interfering noise are not well known and require further analysis before NGSO operations can be permitted.

SkyBridge next argues that the ITU study groups have not taken into account a number of fading sources (*e.g.*, sun outages, sand storms, equipment degradation, etc.), which SkyBridge asserts will decrease actual satellite unavailability. Thus, SkyBridge argues that 10% of the overall unavailability is actually a larger number than is being used as the basis for epfd limit generation in ITU study groups. SkyBridge, however, has it backwards. These additional factors, such as sun outages, cause the *link margin to decrease*, which makes the link *more sensitive,* not less, to additional interference.

Finally, SkyBridge discusses the conservatism built into the ITU software validation tool that will be used to assess compliance of an NGSO system with interference limits.[62] DIRECTV has not actively participated in the development of this tool, but is very concerned about the accuracy of the model it will use for calculating levels of NGSO FSS interference. This model may be so conservative that it hinders efforts to arrive at epfd limit masks acceptable to all parties. That is, NGSO interests may have to add significant margins to the limits to ensure that their systems can pass, and these limits would allow unavailability increases in excess of the

---

62 SkyBridge Comments at 38, 94-97.

aggregate 10% criterion. They also might be technically misleading or worse. As DIRECTV has repeatedly urged, NGSO FSS interests should be required to provide more detail to verify the operational integrity of their systems, including operational descriptions and system performance data. This information can be incorporated into the validation tool so that it more accurately represents the true interference environment. All parties, NGSO and GSO alike, will benefit from more accurate modeling.

B. Impact On NGSO Systems Of A Tightening Of EPFD Limits

SkyBridge devotes a section of its comments to a discussion of the detrimental impact on its system of a tightening of short-term and long-term epfd limits.[63] However, in terms of assessing the reasonableness of this burden on SkyBridge if limits are tightened, it is important to note that other NGSO FSS systems have now been proposed that purport to provide significantly better interference levels into GSO systems than SkyBridge.[64] The FCC should take note of these designs in assessing the SkyBridge system design in NGSO rulemaking and licensing proceedings. It is in the public interest for the Commission to encourage NGSO FSS operators to deploy the most "GSO-friendly" systems possible.

C. Number Of NGSO Systems

As DIRECTV observed in its initial comments,[65] the JTG 4-9-11 has not decided on a value of "n," the number of NGSO FSS systems that could ultimately share the same frequency

---

63 *Id.* at 39.

64 *See, e.g.*, Comments of Boeing at 14, 17.

65 *See* Comments of DIRECTV at 19 & Technical Appendix A at 33.

band. SkyBridge has chosen to set n=3 for its analyses and derivation of epfd limit masks.[66] DIRECTV has chosen n=5 as a baseline for its analysis.

From the point of view of a GSO BSS operator, the use of differing assumptions for "n" simply highlights why the collective compliance of NGSO systems with an *aggregate* epfd limit is so fundamental to the protection of GSO BSS systems. The reason for the development of such an aggregate limit in part is precisely the uncertainty surrounding the number of NGSO systems and satellites that could ultimately share the NGSO space and spectrum resource.

As DIRECTV noted in its initial comments, work to provide a definitive value for "n" has been inconclusive at best, and serious issues surrounding the implementation of an aggregate limit will still need to be addressed regardless of how that number is defined. Most critical is that the Commission ensure that regulatory mechanisms are in place to guarantee that the aggregate epfd limit is not exceeded *irrespective* of the number of NGSO FSS providers that are ultimately authorized to operate at Ku band.[67] DIRECTV strongly agrees that any effective spectrum sharing between NGSO FSS systems and GSO systems will require aggregate and single entry pfd limits that are well-defined and strictly enforced.[68]

D. Long-Term EPFD Limit Determination

In discussing NGSO FSS/GSO interference protection criteria, Boeing argues that the establishment of the long-term portion of the epfd mask should not depend on meeting

---

66 Comments of SkyBridge at 29.

67 *See* Comments of GE Americom at 9.

68 *Id.* at 10; *see also* Comments of PanAmSat at 14 (Commission should include in each NGSO FSS license the allocated share of the aggregate interference limits and an express condition that the licensee not exceed its individualized interference limit).

unavailability degradation criteria, but merely should require an NGSO system to meet C/N degradation criteria.[69] DIRECTV strongly disagrees.

C/N degradation can be directly related to unavailability degradation, which ultimately is the fundamental parameter that must be protected for BSS systems. This relationship has long been accepted in the satellite communications technical community. Limits on unavailability degradation are the primary basis for the establishment of the long-term portion of the masks that are under consideration in JTG 10-11S. DIRECTV strongly opposes any move to establish separate C/N degradation criteria for the establishment of BSS protection masks because this shifts the focus away from identification of the more basic performance parameter, *i.e.*, unavailability degradation.

DIRECTV notes that Boeing's proposal on this issue is confined to a discussion of sharing with GSO FSS systems, and is not explicitly proposed to apply to BSS systems. Boeing appears to recognize the fact that the BSS has used a different basis for establishing BSS protection masks. In any event, DIRECTV urges that the 10-11S PDNR criteria be used to establish BSS protection limits, and not a new value of C/N degradation.

E. Artificial Separation Of Long-Term And Short-Term Interference Limits

DIRECTV notes that Boeing's discussions of the concepts of, and attempt to draw sharp distinctions between, long-term and short-term interference limits,[70] have become outmoded as a result of new developments within the JTG 4-9-11 community. Specifically, the distinction between short-term and long-term limits has become blurred by the concept of multi-segment

---

69 *See, e.g.,* Comments of Boeing at 4, 12, 17.

70 *Id.* at 16.

epfd masks, and the recent development of software that can accurately predict the impact on unavailability due to continuous masks, as opposed to masks with only two distinct limiting values. Indeed, there truly is no longer a distinction between "long-term" and "short-term" limits.

This blurring of the distinction between long-term and short-term interference protection limits, along with the capability to develop multiple segment continuous epfd masks, has allowed more accommodation of the characteristics of NGSO FSS systems while providing protection of BSS systems per the PDNR. DIRECTV believes that this type of progress in finding common ground with respect to NGSO/GSO sharing should be facilitated by the Commission.

F. Protection Of Future BSS Systems

In its discussion of the protection of future BSS systems, SkyBridge attempts to address BSS concerns in part by noting that "future" BSS systems, at least, will be able to "plan for the NGSO FSS environment."[71] It is true that, once the epfd limits are established (especially the aggregate epfd limit), BSS system designers will have some measure of certainty with respect to the NGSO interference protection environment. However, it is still true that limits could be established now that clearly would hinder future BSS growth.

Two examples of advanced technology BSS links are included in the ITU CR-116 database. These links are identified in the database as US-GSO D4, which is a link using 8PSK digital modulation, US-GSO D11 (another 8PSK link), and links US-GSO D6(a), D6(b), D12(a) and D12(b), which have an improved receiver temperature of 80 degrees. The Commission must ensure that any epfd limits adopted fully protect these links in order to preserve the ability of

---

[71] Comments of SkyBridge at 64.

BSS systems to innovate. Even SkyBridge agrees that "improved BSS service should not be stifled by the Article S22 limits."[72]

G. Protection of BSS Operations Against NGSO Failures

With regard to the concern that DIRECTV and others have expressed regarding validation of the operational integrity of NGSO FSS systems before they are deployed, SkyBridge is dismissive, stating that there is no cause for concern because "[a]ny failure that could theoretically adversely affect another system would necessarily severely impact the operation of the SkyBridge system."[73] This assertion is wholly conclusory and unsupported by any technical failure analysis, which DIRECTV believes must be a prerequisite to authorizing any NGSO system to operate in GSO-utilized frequencies.

As DIRECTV has urged,[74] a failure analysis should be conducted for each NGSO system to show that these systems are no more likely to cause disruptive interference due to failures than are GSO BSS or FSS systems, given the billions of dollars that GSO operators have invested in their systems. Furthermore, because of the uniqueness of the proposed operating modes of NGSO FSS systems, a demonstration phase for such systems is strongly encouraged.

H. NGSO FSS Gateways and BSS User Terminals Cannot Share the 17 GHz Band

DIRECTV strongly disagrees with SkyBridge's conclusion that NGSO gateway terminals can share the 17 GHz band with GSO BSS user terminals that will receive DBS programming downlinked using BSS reverse band operations. SkyBridge cites DIRECTV's pending

---

72 *Id.*

73 *Id.* at 55.

74 *See* Comments of DIRECTV at 21-23.

rulemaking petition to allow BSS reverse band operations at 17 GHz[75] in support of its claim that sharing of BSS operations "with existing GSO gateway operations in the band is possible so long as the gateways have a good antenna pattern, a limited EIRP and a RF fence, and are not numerous."[76] SkyBridge has mischaracterized DIRECTV's position.

In the filing that SkyBridge references, DIRECTV requested the Commission to seek comment on the types of measures that *BSS uplink operators* should take in order to minimize potential interference, not measures for NGSO gateway operators.[77] There is a fundamental difference in these two situations, which primarily is one of degree. There are expected only to be on the order of 6 BSS uplink sites across the United States, which can be easily managed and will have minimal impact on nationwide BSS operations. By contrast, there could easily be many dozens and perhaps hundreds of gateway earth stations deployed by NGSO operators. If this is so, the interference effects of NGSO gateways on reverse band BSS operations at 17 GHz are likely to be severe.[78] Moreover, SkyBridge itself notes that there may be multiple gateway

---

75 *See* Petition of DIRECTV Enterprises, Inc. to Amend Parts 2, 25 and 100 of the Commission's Rules to Allocate Spectrum for the Fixed-Satellite Service and the Broadcasting-Satellite Service, RM No. 9118 (filed June 5, 1998) ("Reverse Band Petition").

76 Comments of SkyBridge at 19.

77 Reverse Band Petition at 9.

78 SkyBridge asserts that with natural and artificial shielding, separation distances can be reduced to a few kilometers. However, in the U.S. document JTG 4-9-11/312, the calculated separation distances with an assumed shielding loss of 20 dB range from 1.6 km to 9.4 km, depending on the pointing angle of the gateway antenna. JTG 4-9-11/312 at 2. At the maximum separation distance of 9.4 km, the document finds that up to *25,000 residences* are potentially affected. *Id.* at 3.

stations per beam.[79] This observation only exacerbates the concern that the number of gateway stations across the U.S., when compared against the number of BSS feeder link stations, will be extremely large.

The 17.3-17.8 GHz band is the only other band available for future BSS downlink use and it must be protected for this allocated service. Allowing NGSO gateway stations to operate at 17 GHz is clearly detrimental to the successful development of this important BSS spectrum resource, and should not be permitted.

IV. CONCLUSION

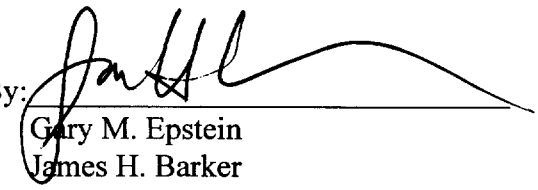
The Northpoint and NGSO inter-service sharing proposals each present dramatic risks to the operation and growth of U.S. DBS service. For the reasons that DIRECTV has stated, the Northpoint proposal to use the 12 GHz band for secondary terrestrial operations should be denied. Furthermore, the Commission should continue to explore the feasibility of NGSO/GSO sharing, but must at all costs ensure that BSS operations are protected before taking any action to authorize the introduction of NGSO systems into the BSS downlink band.

---

79 Comments of SkyBridge at 69.

Respectfully submitted,

DIRECTV, INC.

By: 

Gary M. Epstein
James H. Barker
LATHAM & WATKINS
1001 Pennsylvania Avenue, N.W.,
Suite 1300
Washington, D.C. 20004-2505
(202) 637-2200

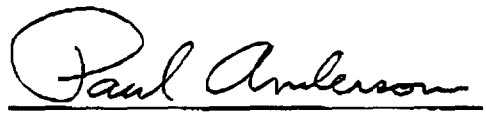
Dated: April 14, 1999

DECLARATION OF PAUL R. ANDERSON

I, Paul R. Anderson, hereby declare as follows:

1. I am Director, Communications Systems for DIRECTV Enterprises, Inc. I am an engineer by training and am familiar with the technical and interference characteristics of DIRECTV's Direct Broadcast Satellite system, the technical requirements of the Commission's rules, and the interference and technical issues referenced in the foregoing petition.

2. I have reviewed the foregoing filing from a technical perspective, and the information found therein is true and accurate to the best of my knowledge, information and belief.



Paul R. Anderson
Director, Communications Systems
DIRECTV Enterprises, Inc.

April 14, 1999